# BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest, 2005

Final Round, Part A

Friday May 6, 2005

1. The number of integers between 500 and 600 which have 12 as the sum of their digits is:

   (A) 6   (B) 7   (C) 8   (D) 10   (E) 12

2. The radius of the largest sphere that can fit entirely inside a right circular cone with a slant height of 10 cm and a base radius of 5 cm is:

   (A) $\dfrac{5\sqrt{3}}{3}$ (B) 5   (C) $\dfrac{10\sqrt{3}}{3}$ (D) 10   (E) None of these

3. A triangle with sides 5 cm, 12 cm, and 13 cm is divided into two parts with a single cut and reformed into a rectangle. The largest possible perimeter of the rectangle is:

   (A) 22   (B) 29   (C) 30   (D) 31   (E) None of these

4. A ten digit code is represented by 4ABCDEFG8H. If the sum of any three successive digits is 19, the value of the digit D is:

   (A) 4   (B) 5   (C) 7   (D) 8   (E) 9

5. The product $\left(1 + \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 + \frac{1}{4}\right)\left(1 - \frac{1}{5}\right)\cdots\left(1 - \frac{1}{n-1}\right)\left(1 + \frac{1}{n}\right)$ is equal to:

   (A) 1   (B) $\dfrac{1}{n}$ (C) -1 (D) $\dfrac{1+n}{n}$ (E) None of these

6. Six people arrive to purchase $10 tickets for a movie. Three of them have only $10 bills and three have only $20 bills. The person selling the tickets initially has no change. The probability that the people line up in such a way the the person selling the ticket always has enough change is:

   (A) $\dfrac{1}{4}$ (B) $\dfrac{3}{10}$ (C) $\dfrac{1}{10}$ (D) $\dfrac{3}{5}$ (E) $\dfrac{3}{4}$

7. In the diagram, $ABCD$ is a square with side length 17 and the four triangles ABF, ADE, BCG, and CDH are congruent right triangles. Further, $\overline{FB} = 8$. The area of the shaded quadrilateral $EFGH$ is:

   (A) $12\sqrt{17}$ (B) 49   (C) $\dfrac{169}{4}$

   (D) 64   (E) 81
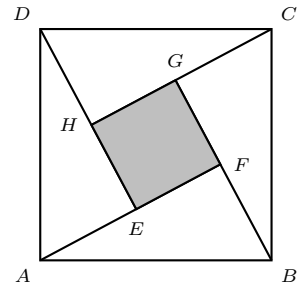
8. The game of Solitaire JumpIt is played on a 3×3 grid. A single
    player places two or more game discs on the grid. If two discs, A
    and B, are adjacent horizontally, vertically, or diagonally and there
    is an open space on the side of B away from A, then A can jump B
    and disc B is removed. See the diagram. The player makes jumps
    as long as possible. The player wins if he or she can continue until
    only one disc remains. The maximum of discs that can be placed
    on the grid and still win the game is:
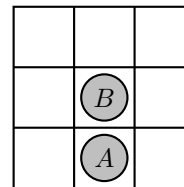
    (A) 3   (B) 4   (C) 5   (D) 6   (E) 7

9. The numbers 3, 7, 11, 15, ... (where each number is four more than the preceding number) are written
    in a book starting at page 1 and writing 20 numbers on each line with 30 lines per page. The page on
    which the number 17655 is written is:

    (A) 4   (B) 5   (C) 6   (D) 7   (E) 8

10. The Preliminary Round of the BC High School Mathematics contest is composed of 15 multiple choice
    questions. If each question is awarded 0 or 1, the number of students that must be in the contest to be
    sure that at least 30 students get the same final score in the contest is:

    (A) 436   (B) 450   (C) 451   (D) 465   (E) 481